

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Appl. No. : 10/529,530  
Applicant (s) : Karjala et al.  
Filed : March 29, 2005  
TC/A.U. : 1797  
Examiner : B.A. McCaig  
Title : LIQUID AND GEL-LIKE LOW MOLECULAR WEIGHT  
ETHYLENE POLYMERS  
Docket No. : 62144B  
Customer No. : 00109

Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

Sir:

**DECLARATION UNDER 37 C.F.R § 1.132**

I, BRIAN W.S. KOLTHAMMER, declare and state the following:

- (1) I am a Research Fellow in the Basics Plastics and Chemicals Research and Development Laboratory, at The Dow Chemical Company, B-1450 Building, 2301 Brazosport Blvd., Freeport, Texas 77541.
- (2) I received a B.S. degree in Chemistry, with honors, in 1975, and a Ph.D. degree in Chemistry, in 1979, both from The University of British Columbia. I was a NATO Science Fellow from 1979 to 1981 at Texas A&M University.
- (3) I am currently an employee of The Dow Chemical Company ("Dow"), and have been continuously employed by Dow, as a research chemist and/or scientist, for 29 years. I have worked in the area of polymerization catalysts and polymer characterization, and I am familiar with catalysts used in olefin polymerizations. I have studied polyolefins and the associated catalysts, including structure/activity relationships in these polymerizations, for 29 years. I am one of the inventors of the invention described U.S. Application No. 10/529,530 (hereinafter "the '530 Application").

(4) I have read, and I am familiar with, U.S. Patent 5,811,379 (hereinafter the '379 patent). Based on my knowledge of the art, and the teachings in the '379 patent, I understand that the paragraph, at column 9, lines 13-24 of the '379 patent, was included to reference the noted patent art for the methods of preparation of the ionic catalysts using non-coordinating anion complexes, disclosed in this art, and not for the particular transition metal components of the catalysts (based on metallocenes, the description used in the '379 patent) disclosed in these references. The transition metal catalyst systems disclosed in these references are not the "late transition metal catalyst systems" required by the invention of the '379 patent, and the transition metal catalyst systems disclosed in these references would not produce the desired polymers of the '379 patent. The '379 patent does not favor metallocene or Ziegler-Natta catalyst systems, as shown, for example, by the following teachings: 1) metallocene and Ziegler-Natta catalyst systems are more sensitive to impurities and catalyst poisons (see column 4, lines 5-12, and column 10, lines 57-61); 2) metallocene and Ziegler-Natta catalyst systems produce polymers whose short chain branch length is singular (that is, the chain branch is determined by the monomer polymerized into polymer backbone), as opposed to a distribution of branch lengths resulting from the polymerization of each monomer or a combination of monomers (see column 20, lines 38-50); and 3) polymers produced using metallocene catalyst systems result in terminally unsaturated polymers with a high concentration of vinylidene type unsaturation relative to vinyl type unsaturation (thus, as implied by the '379 patent, would lead to lower "active ingredient concentrations" of the dispersant additives produced therefrom (see column 3, line 66 to column 4, line 4; column 18, line 60 to column 19, line 2; and column 19, lines 25-42)).

(5) As discussed, the '379 patent describes the polymerization of olefins using "late transition metal catalyst systems,"  $LMX_r$ , where M is a group 9, 10 or 11 metal (see, for example, column 5, lines 31-36). The '379 patent desires to produce polymers derived from one or more olefins, and which have the following features: (1) an average ethylene sequence length (ESL) from about 1.0 to less than about 3.0, (2) at least about 50% of the branches being methyl and/or ethyl branches, and other properties, as noted,

for example, in the abstract of the '379 patent. These properties are derived from the polymerization behavior of the "late transition metal catalyst system," a key feature of the '379 patent. If a late transition metal is not used in the complexes described in the '379 patent, features (1) and (2) above would not be produced, because such complexes (with an earlier transition metal) would not show "chain straightening behavior," and thus would produce polymers with longer ethylene sequence lengths, if ethylene is present in the copolymerization, or an ESL of zero, if no ethylene present in the polymerization, and polymers with higher levels of vinylidene termination.

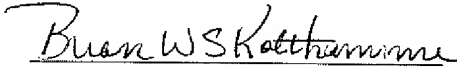
(6) The homogeneous substantially linear, liquid, or gel-like, low molecular weight ethylene/alpha-olefin polymers, claimed in the '530 application, are produced by copolymerizing ethylene with a higher alpha-olefin. The polymers claimed in the '530 application each contains a longer ethylene sequence length (ESL greater than 3), and consists of 100% of its short chain branches defined by the side chain of the alpha-olefin comonomer (for example, for an octene comonomer, every side chain is a hexyl branch). The late transition metal catalysts disclosed in the '379 patent will not produce the homogeneous substantially linear, liquid, or gel-like, low molecular weight ethylene/alpha-olefin polymers claimed in the '530 application. The catalysts of the '379 patent show poor copolymerization behavior with respect to the reactivity of alpha-olefins compared to the reactivity of ethylene. In the presence of ethylene, the '379 catalysts will not incorporate an alpha-olefin to the extent required to form a liquid, or gel-like, ethylene/alpha-olefin polymer (each containing high amounts of the alpha-olefin, sufficient to achieve the respective liquid or gel-like form).

(7) I have read, and I am familiar with U.S. Patent 5,132,380 (hereinafter the '380 patent). This patent discloses certain ionic catalysts having the general formula " $\text{CpMX}_n^+ \text{A}^-$ " (see, for example, column 1, lines 41-65). None of the actual transition metal complexes described in the '380 patent (see column 3, line 64 to column 4, line 30), contain a late transition metal. If M is chosen from the late transition metals, an inactive olefin polymerization catalyst system would result and/or a catalyst system with a poor reactivity for higher alpha-olefins relative to ethylene would result. In

addition, these catalyst systems would not show "chain straightening behavior," a key feature of the "late transition metal catalyst systems" of the '379 patent (see column 22, lines 15-20 of the '379 patent). Therefore, if these '380 catalyst systems (with M chosen from the late transition metals) were used in the polymerization processes of the '379 patent, these catalysts systems would not readily incorporate a higher alpha-olefin, while polymerizing ethylene, and would not produce a liquid, or gel-like, low molecular weight ethylene/alpha-olefin polymer, as claimed in the '530 application.

The undersigned declares further that all statements made, herein, of his own knowledge are true, and that all statements made on information and belief, are believed to be true; and further that these statements were made with the knowledge that willful, false statements, and the like, so made, are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Date November 25, 2009

  
Brian W.S. Kolthammer, Ph.D.